

Arrowhead Drain Design/Build Report

Kosciusko County, Indiana

October 13, 2004



Prepared for:

Chapman Lakes Foundation
P.O. Box 776
Warsaw, Indiana 46581



Prepared by:



708 Roosevelt Road
Walkerton, Indiana 46574
574-586-3400

ARROWHEAD DRAIN DESIGN/BUILD REPORT EXECUTIVE SUMMARY

This project addresses the streambank and bed erosion occurring within the open channel of Arrowhead Drain between County Road 325 East and Chapman Lake Drive and the subsequent delivery of sediment to Little Chapman Lake in Kosciusko County, Indiana. The primary goal of the project was to stabilize the eroding streambank and bed of Arrowhead Drain within this reach. This was accomplished through the installation of grade control structures and soil encapsulated lifts. This project was made possible in part by the cooperation of the Chapman Lakes Foundation and McDaniel Properties (landowner). The project was funded by the Indiana Department of Natural Resources' Lake and River Enhancement (LARE) Program and Chapman Lakes Foundation.

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ARROWHEAD DRAIN DESIGN/BUILD REPORT

KOSCIUSKO COUNTY, INDIANA

1.0 PROJECT DESCRIPTION AND PURPOSE

Arrowhead Drain, legally known as the Robert Shroyer Drain, is located to the east of Little Chapman Lake in Kosciusko County, Indiana (Figure 1). Arrowhead Drain's open channel begins near the Chapman Lake Conservation Club on County Road 325 East and flows to the west where it enters Little Chapman Lake west of Chapman Lake Drive. Arrowhead Drain had become isolated from its floodplain due to historic channelization. As a result, stormflow events were contained within the channel causing severe streambank and bed erosion within the project reach. The purpose of this project was to stabilize the eroding streambanks and bed of Arrowhead Drain between County Road 325 East and Chapman Lake Drive, thereby reducing the delivery of sediment and associated nutrients to Little Chapman Lake.

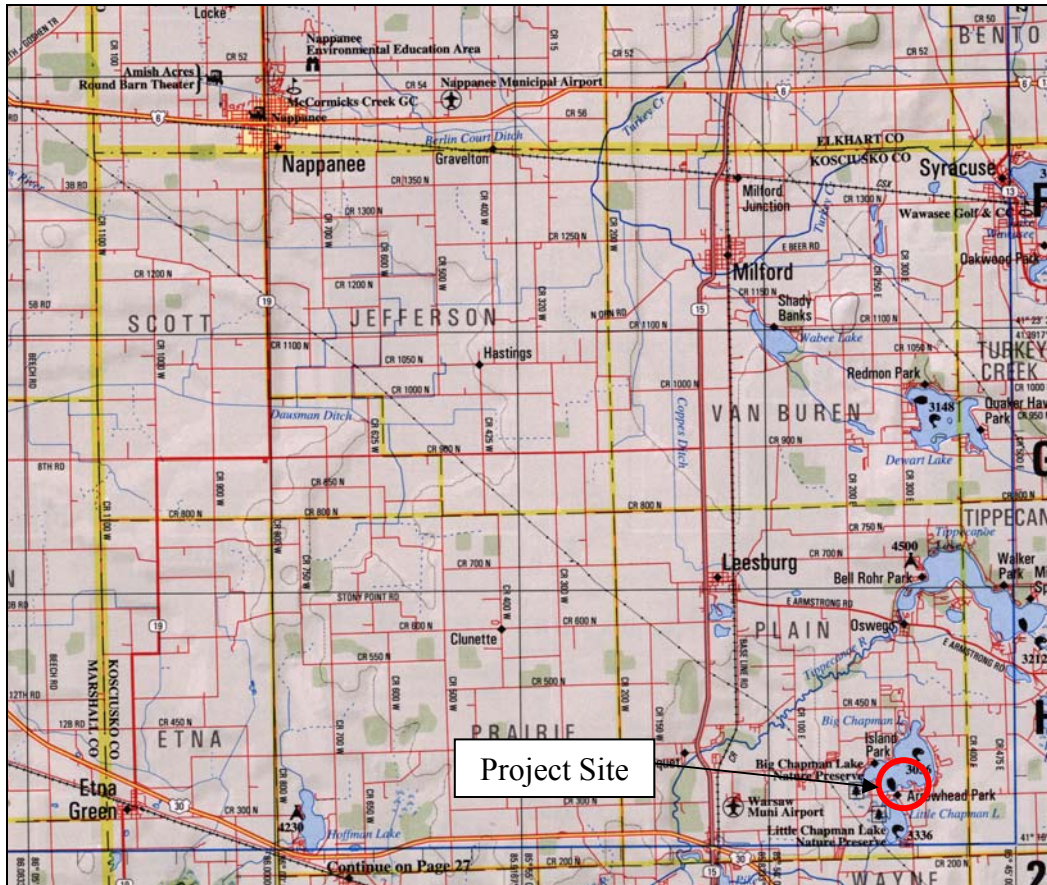


Figure 1. Approximate project site location.

2.0 DESIGN RATIONALE

A majority of the Arrowhead Drain project site is located within a second growth forest having wetland pockets and drainages scattered throughout. To minimize the impact to these natural areas, all construction activity had to occur within the existing channel (i.e. no excavation of streambanks to reduce the slope). A series of eight grade control structures were installed to

prevent further down cutting of the streambed. Grade control structures were strategically placed so that the peak elevation of the downstream structure was at or near the same elevation as the immediately upstream structure's base (Appendix A, Stream Profile). This design will not only prevent further streambed down cutting, but also promote sediment deposition between grade control structures and help alleviate streambank collapse. Over time, the streambed's gradient will be reduced and the streambed elevation raised thus allowing Arrowhead Drain to access its floodplain during high flow events. Additionally, two streambank stabilization treatments were installed along the project reach. Streambanks with gentle gradients were seeded and blanketed with erosion control blanket. A rock toe was also placed along the base of the bank to further protect the bank from erosion. Steeper sloped banks within the project reach received a more protective treatment. In these areas, a rock platform was installed along the base of the bank. This platform supported a modified soil encapsulated lift that was seeded with a native seed mix.

3.0 DESIGN AND CONSTRUCTION SPECIFICS

3.1 Landowner Agreement

McDaniel Properties, which own the entire project site, granted permission to construct the project. A signed copy of the landowner agreement is held on file at JFNew's corporate office located in Walkerton, Indiana and the Chapman Lakes Foundation office.

3.2 Permitting

Permit applications were submitted to the U.S. Army Corps of Engineers, Indiana Department of Environmental Management, and the Kosciusko County Drainage Board. An Indiana Department of Natural Resources permit was not required for this project since the drainage area at the downstream end of the project site was less than one square mile. A Regional General Permit was granted from the U.S. Army Corps of Engineers on April 16, 2004 under Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act. The Indiana Department of Environmental Management granted Section 401 Water Quality Certification on April 8, 2004. The Kosciusko Drainage Board gave verbal approval in support of the project. Permit correspondence can be found in Appendix B.

3.3 Grade Control Structures

A series of eight grade control structures were installed within the project reach. Two grade control structures were deleted from final construction. These two grade control structures were to be placed in small tributaries to Arrowhead Drain. Grade control structures were constructed by excavating a key trench three feet into each streambank and two feet into the streambed. The bottom and sides of each key trench were then lined with a non-woven geotextile fabric. The key trench was then filled with 12-24 inch diameter rock (riprap) and then capped with 4-12 inch fieldstone (Figure 2). The fieldstone was graded to a 4:1 slope on the upstream face and 15:1 slope on the downstream face. Each grade control structure was built up to the appropriate elevation according to the plans. Site plans and grade control structure details and modifications can be found in Appendix A.



Figure 2. A completed grade control structure on Arrowhead Drain.

3.4 Streambank Stabilization

Approximately 900 lineal feet of streambank was stabilized throughout the project reach utilizing a combination of treatment types (Appendix A: Bank Treatment Details). Treatment A was utilized on gently sloped streambanks adjacent to Chapman Lake Drive. The existing streambank was regraded, seeded, and then covered with an erosion control blanket (North American Green C-250). Twelve-inch long metal sod staples were then installed on 3-foot centers along the erosion control blanket. Fieldstone was then placed over the erosion control blanket at the bank's base. Treatment B required the construction of a small rock shelf at the streambank's base. This rock shelf supported a modified soil encapsulated lift. Non-woven geotextile fabric was placed on top of the shelf to prevent soil from being washed through the rock. An erosion control blanket (North American Green C-250) was then rolled out parallel to the streambank, filled with soil, seeded with a native seed mix, and then folded back and pinned to the bank (Figure 3). Three-foot long, 3/8-inch diameter rebar with 2-inch washers welded on for heads was used to pin the blanket along its top of slope edge. Twelve-inch long metal sod staples were then installed on 3-foot centers along the erosion control blanket. Streambank treatment details and modifications can be found in Appendix A.



Figure 3. A modified soil encapsulated lift along Arrowhead Drain.

4.0 CONSTRUCTION SCHEDULE

Rowland and Associates, Inc. surveyed the project site in December of 2003. Construction began in April of 2004. All grade control structures and 50% of the streambank stabilization work was completed by May 10, 2004. Wet construction site conditions delayed construction completion and clean up until October of 2004.

5.0 MONITORING AND MAINTENANCE ACTIVITY

Monitoring of the project site should be conducted on an annual basis for the next three to five years. At a minimum, the project area should be inspected in late spring or early summer following a storm flow event within Arrowhead Drain. Storm flows pose the biggest threat to the structural integrity of the project site. Structural integrity failures would include, but are not limited to, items such as rock armoring, grade control structures, or soil encapsulated lifts being washed out and erosion control blankets being torn away. If any of these situations are noted during the inspection, action should be taken to resolve the situation in a timely manner. Other monitoring activities should include the inspection of plantings along the streambanks treated with erosion control blanket. If large barren patches, approximately one square yard, are noted along the erosion control blanket, they should be reseeded with an appropriate seed mix.

6.0 PROJECT SUMMARY

The overall purpose of this project was to stabilize the eroding streambanks and bed of Arrowhead Drain between County Road 325 East and Chapman Lake Drive, thereby reducing the delivery of sediment and associated nutrients to Little Chapman Lake. Arrowhead Drain was stabilized by installing eight grade control structures and approximately 900 lineal feet of modified soil encapsulated lifts along its streambanks. The functionality of the soil encapsulated lifts will be further enhanced once the native plant growth occurs.

APPENDIX A
SITE PLANS AND DESIGN DETAILS

ID: L:\Drawings\CAD Project Library\990401-04 Arrowhead Ditch\01-PROFILE modified.dwg Thu, 5 Feb 2004 - 9:11

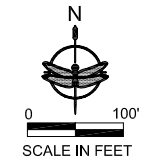
LEGEND

- Treatment Plan A Location
- Treatment Plan B Location
- Grade Control Location

NOTES:

- Survey performed by Rowland Associates, Inc., January 2004.

REVISIONS:			



SCALE VERIFICATION
This bar measures 1" on 22"x34" or 1/2" on 11"x17" original. Adjust scale accordingly.

Corporate Office
708 Roosevelt Road
Walkerton, Indiana 46574
574-586-3400 fax 574-586-3446

Cincinnati Office
8080 Beckwith Center Dr., Suite 226
West Chester, Ohio 45069
513-942-3446 fax 513-942-3447

Illinois Office
722 West Exchange, Suite 4
Crest, Illinois 60417
708-367-1130 fax 708-367-1132

Indianapolis Office
6640 Parkside Plaza, Suite 5
Indianapolis, Indiana 46254
317-388-1982 fax 317-388-1986

Michigan Office
608 South Beacon
Grand Haven, Michigan 49417
616-847-0800 fax 616-847-0870

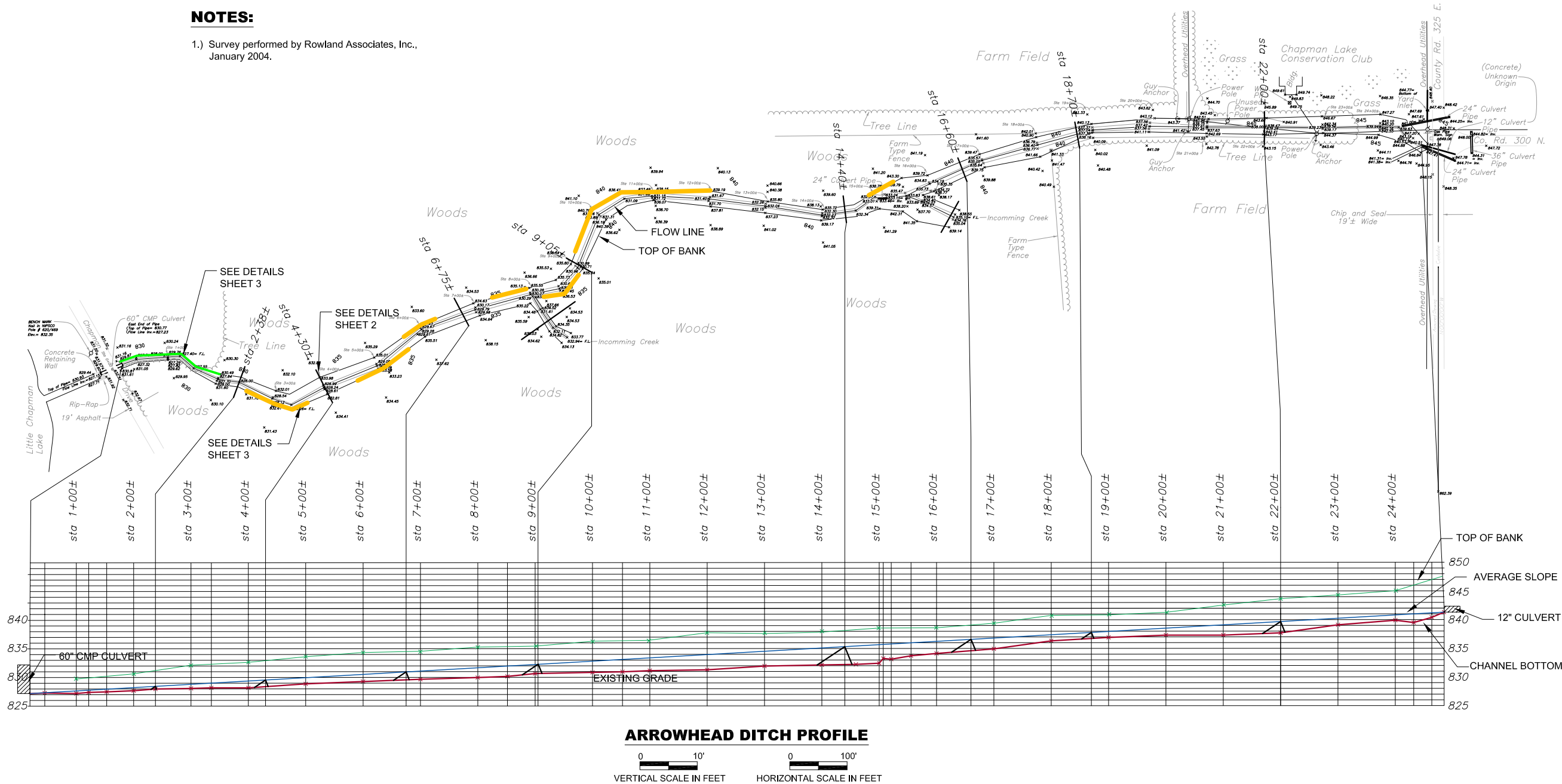


ARROWHEAD DITCH
LAKE CHAPMAN
STREAM PROFILE

DRAWN BY: SKL
DESIGNED BY: JR
CHECKED BY:
DATE: JAN 2004
JOB NO: 990401
SCALE: AS NOTED



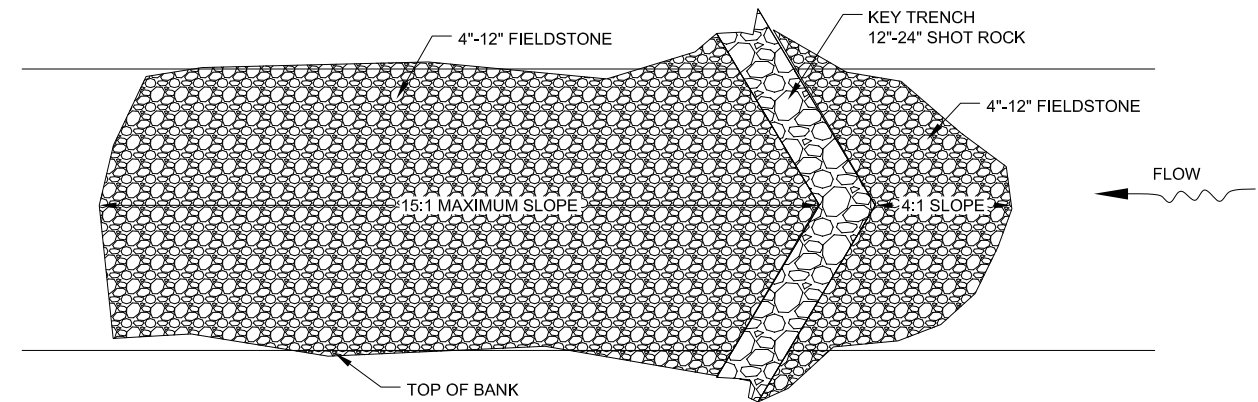
01-PROFILE.DWG
DRAWING NO.
1
OF 3



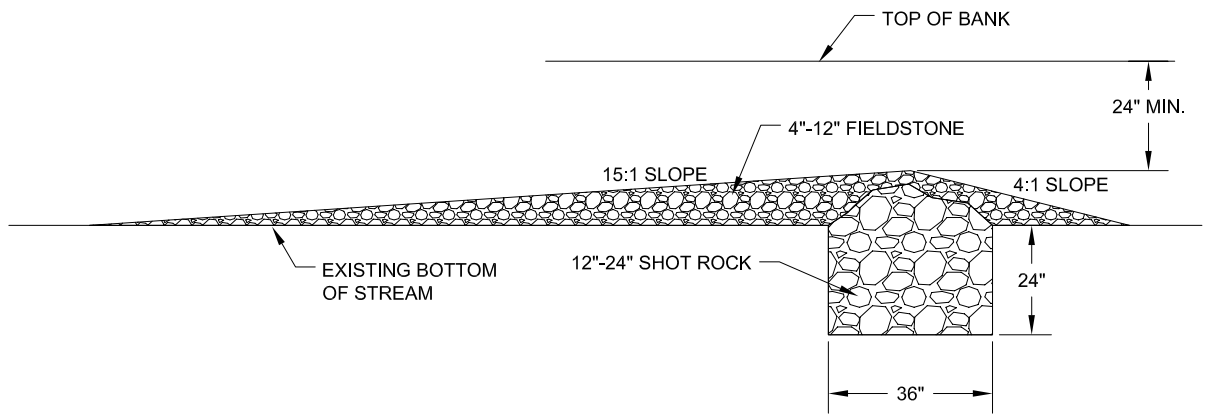
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NOT APPROVED FOR CONSTRUCTION.

PRELIMINARY ENGINEERING DRAWING:
NOT APPROVED FOR CONSTRUCTION.

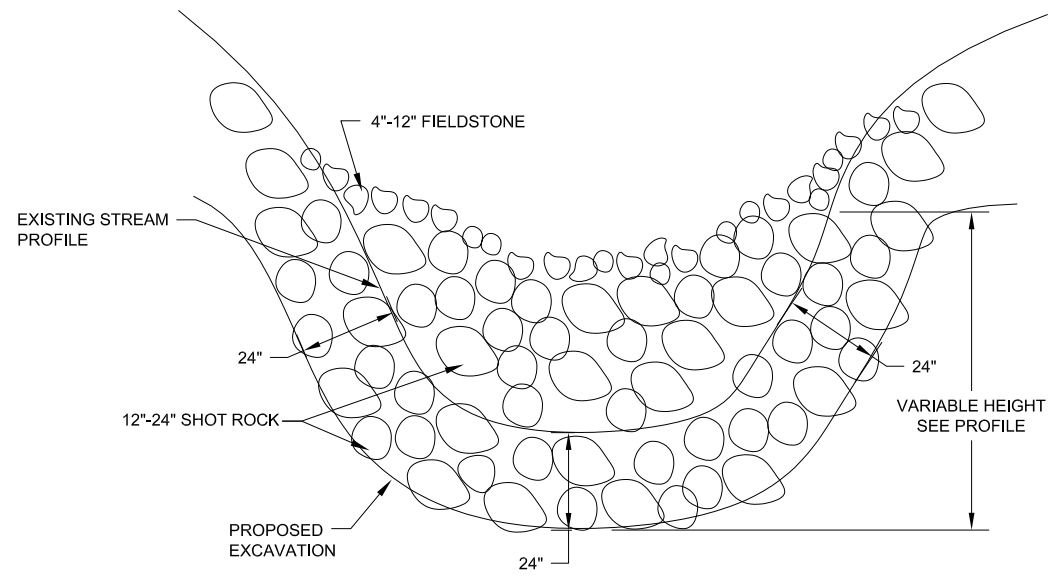
REVISIONS:			



1
2 **GRADE CONTROL - PLAN VIEW TYPICAL**
NOT TO SCALE



2
2 **GRADE CONTROL - PROFILE TYPICAL**
NOT TO SCALE



3
2 **GRADE CONTROL KEY TRENCH - CROSS SECTION TYPICAL**
NOT TO SCALE

PERMIT SUBMITTAL DRAWING:
NOT APPROVED FOR CONSTRUCTION.

PRELIMINARY ENGINEERING DRAWING:
NOT APPROVED FOR CONSTRUCTION.

SCALE VERIFICATION:
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Cincinnati Office
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Illinois Office
722 West Exchange, Suite 4
Crest, Illinois 60417
708-367-1130 fax 708-367-1132

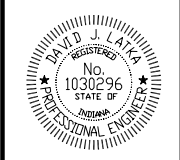
Indianapolis Office
6640 Parkside Place, Suite S
Indianapolis, Indiana 46254
317-388-1982 fax 317-388-1986

Michigan Office
600 South Beacon
Grand Haven, Michigan 49417
616-647-6860 fax 616-647-6870



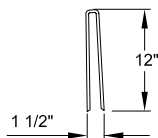
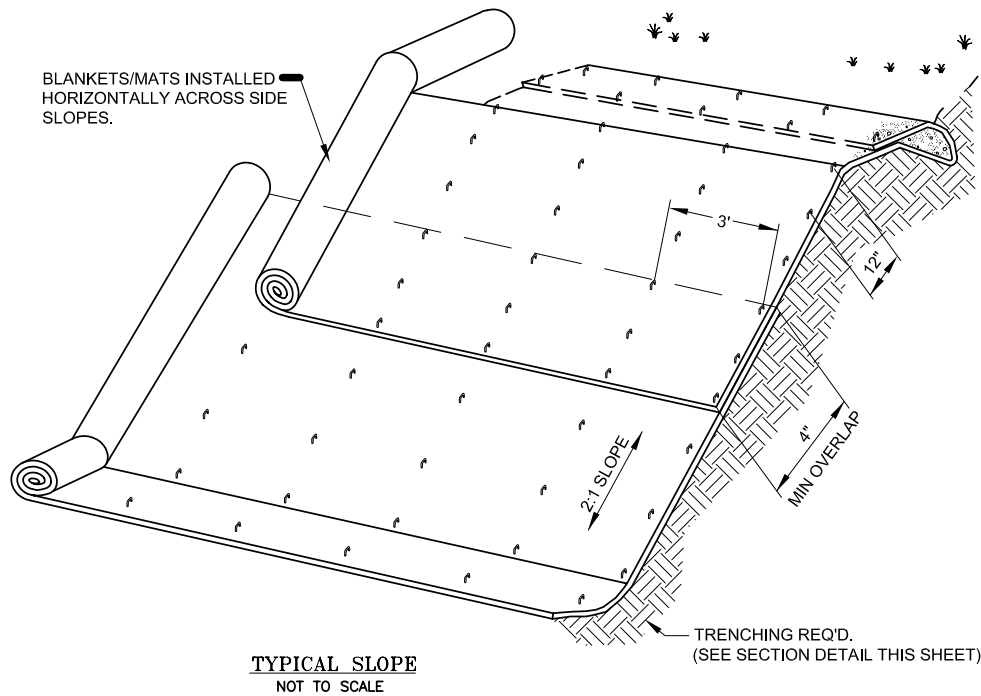
ARROWHEAD DITCH	LAKE CHAPMAN	GRADE CONTROL DETAILS
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DRAWN BY:	SKL/JFH
DESIGNED BY:	JR
CHECKED BY:	
DATE:	JAN 2004
JOB NO:	990401
SCALE:	AS NOTED

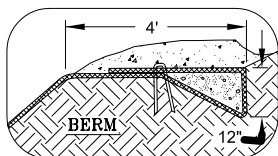


02-GRADE CONTROL DETL.DWG
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OF 3

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STAPLES

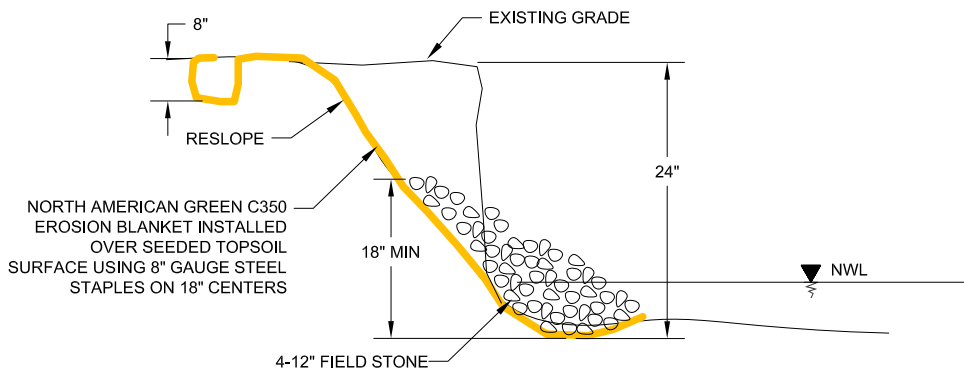


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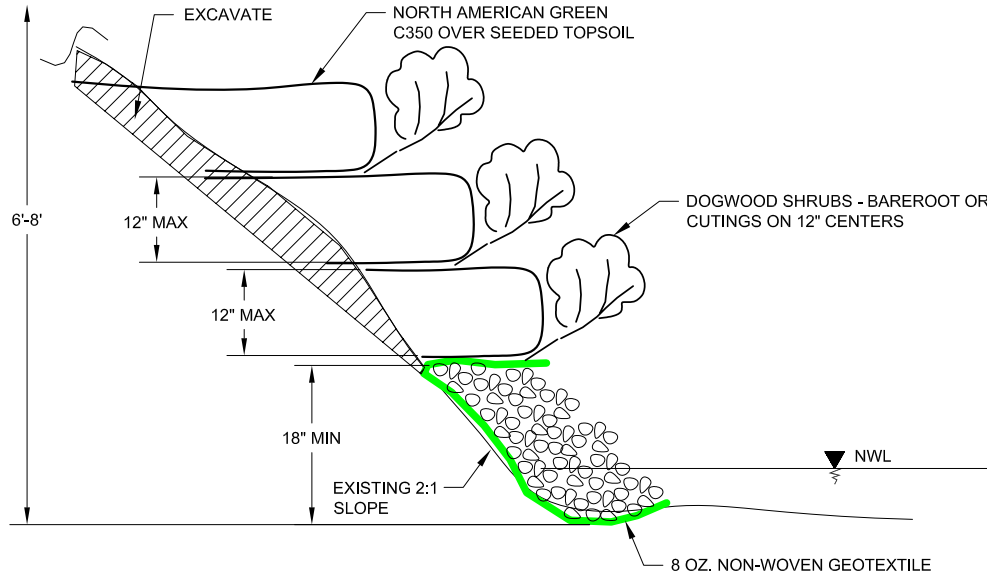
NOTES:

1. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLOUDS, STICKS AND GRASS. MATS/ BLANKETS SHALL HAVE GOOD SOIL CONTACT.
2. APPLY PERMANENT SEEDING BEFORE PLACING BLANKETS.
3. LAY BLANKETS LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH THE SOIL. DO NOT STRETCH.

1
3 EROSION CONTROL BLANKET INSTALLATION DETAILS
NOT TO SCALE



3
3 BANK TREATMENT TYPE A - SECTION TYPICAL
NOT TO SCALE



2
3 BANK TREATMENT TYPE B - SECTION TYPICAL
NOT TO SCALE

SEED MIX

Botanical Name	Common Name	lbs/Acre
<i>Lolium multiflorum</i>	Annual rye	3.0
<i>Elymus riparius</i>	Riverbank wild rye	0.5
<i>Carex grayi</i>	Gray's sedge	1.5
<i>Cinna arundinacea</i>	Common wood reed	32.0
<i>Avena sativa</i>	Oats	15.0

PERMIT SUBMITTAL DRAWING:
NOT APPROVED FOR CONSTRUCTION.

PRELIMINARY ENGINEERING DRAWING:
NOT APPROVED FOR CONSTRUCTION.



SCALE VERIFICATION:
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Walkerton, Indiana 46574
574-886-3400 fax 574-886-3446

Cincinnati Office
8080 Beckett Center Dr., Suite 225
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317-388-1982 fax 317-388-1986

Michigan Office
600 South Beacon
Grand Haven, Michigan 49417
616-647-1660 fax 616-647-6670



ARROWHEAD DITCH
LAKE CHAPMAN

BANK TREATMENT DETAILS

DRAWN BY: SKL

DESIGNED BY: JR

CHECKED BY:

DATE: JAN 2004

JOB NO: 990401

SCALE: AS NOTED

DRAFT

03-BANK TREAT DETL.DWG

DRAWING NO.

3

OF 3

APPENDIX B
PERMIT CORRESPONDENCE



DEPARTMENT OF THE ARMY

U.S. ARMY ENGINEER DISTRICT, LOUISVILLE
CORPS OF ENGINEERS

P.O. BOX 59
LOUISVILLE, KENTUCKY 40201-0059
FAX: (502) 315-6677
<http://www.lrl.usace.army.mil/>

April 16, 2004

Operations Division
Regulatory Branch (North)
ID No. 200400187-trs

Mr. Dan Lee
Chapman Lakes Foundation
36 EMS Lane C28E-1
Warsaw, Indiana 46580

Dear Mr. Lee:

This is in response to your request dated February 6, 2004, for a Department of the Army Permit to place approximately 400 cys of rock below the ordinary high watermark (OHW) of Arrowhead Drain for stream bank stabilization. Approximately 948 linear feet (0.23 acres) of Arrowhead Drain will be impacted by the placement of rock. Once the rock is placed below the OHW, the stream bank will be regraded and planted with a native bank stabilization seed mix. The site is located in Sections 35 and 36, Township 33 North, Range 6 East in Kosciusko County, Indiana.

Under Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act (CWA), the Louisville and Detroit Districts issued Regional General Permit (RGP) No. 1 on February 11, 2000, for certain activities having minimal impact in Indiana. We have verified that your proposed work shown on the enclosed plans and described below is authorized under the RGP. Therefore, you may proceed with the work subject to the enclosed general conditions, the Indiana Department of Environmental Management (IDEM) Section 401 Water Quality Certification (WQC) dated April 8, 2004, and any noted special conditions. Please note that IDEM must be notified as a condition of the WQC.

The following work is authorized: place approximately 400 cys of rock below the ordinary high watermark (OHW) of Arrowhead Drain for stream bank stabilization. Approximately 948 linear feet (0.23 acres) of Arrowhead Drain will be impacted by the placement of rock.

Any new construction activity other than that was submitted may not qualify for the RGP. If your plans change or if additional activities are proposed, please submit revised plans to this office for review prior to construction.

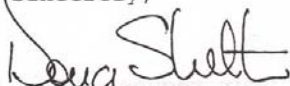
DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT LOUISVILLE
CORPS OF ENGINEERS
FAX 502-625-5577
LOUISVILLE, KENTUCKY 40201-0000

Enclosed is a "Notice of Authorization" to be displayed at the construction site in a conspicuous place. Upon completion of the work authorized by this RGP, the enclosed Compliance Certification form must be completed and returned to this office. This authorization is valid until February 11, 2005.

A copy of this letter will be sent to the Indiana Department of Environmental Management (see enclosure for address).

If you have any questions concerning this matter, please contact this office at the above address, ATTN: CELRL-OP-FN or call Mr. Tim Smith at (317)532-4227. Any correspondence on this matter should refer to our ID Number 200400187-trs.

Sincerely,



Doug Shelton
Chief North Section
Regulatory Branch

Enclosures



INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

We make Indiana a cleaner, healthier place to live.

Joseph E. Kernan
Governor

Lori F. Kaplan
Commissioner

100 North Senate Avenue
P.O. Box 6015
Indianapolis, Indiana 46206-6015
(317) 232-8603
(800) 451-6027
www.IN.gov/idem

April 8, 2004

VIA CERTIFIED MAIL 7002 0510 0004 2630 3876

Mr. Dan Lee
Chapman Lakes Foundation
P.O. Box 776
Warsaw, Indiana 46581-0776

Dear Mr. Lee:

Re: Section 401 Water Quality Certification
Project: Chapman Lakes Foundation-
Arrowhead Drain Stabilization
Project

IDEM No.: 2004-027-43-RDC-A

COE No.: 200400187

County: Kosciusko

Office of Water Quality staff has reviewed your application for Section 401 Water Quality Certification dated February 2, 2004, and received February 10, 2004. According to the application you propose to conduct streambank stabilization and in-channel grade control work within Arrowhead Drain to reduce sediment and associated nutrient loading to Little Chapman Lake. Approximately 948 linear feet of streambank will be regraded and planted with a native bank stabilization seed mix. Streambanks will also be stabilized with soil encapsulated lifts constructed on top of a rock toe. An additional 280 linear feet of fill below Ordinary High Water Mark (OHWM) would occur for the placement of eight grade control structures.

Based on available information, it is the judgment of this office that the proposed project will comply with the applicable provisions of 327 IAC 2 and Sections 301, 302, 303, 306, and 307 of the Clean Water Act if the recipient of the certification complies with the conditions set forth below. Therefore, subject to the following conditions, the Indiana Department of Environmental Management (IDEM) hereby grants Section 401 Water Quality Certification for the project described in your application received February 10, 2004. Any changes in project design or scope not detailed in the application described above or modified by the conditions below are not authorized by this certification.

GENERAL CONDITIONS:

The recipient of the certification shall:

1. Deposit any dredged material in a contained upland disposal area to prevent sediment run-off to any waterbody. Dispose of all dredged and excavated material according to the requirements of 329 IAC 10, governing Solid Waste Land Disposal Facilities. Your project information may be forwarded to the IDEM Office of Land Quality, Industrial Waste Section for review. Sampling may be required to determine if the dredged sediment is contaminated. Failure to properly dispose of contaminated sediment may result in enforcement action against you.
2. Install erosion control methods prior to any soil disturbance to prevent soil from leaving the construction site. Appropriate erosion control methods include, but are not limited to, straw bale barriers, silt fencing, erosion control blankets, phased construction sequencing, and earthen berms. Monitor and maintain erosion control structures and devices regularly, especially after rain events, until all soils disturbed by construction activities have been permanently stabilized.
3. Clearly mark the construction limits shown in the attached plans at the project site during construction.
4. Allow the commissioner or an authorized representative of the commissioner (including an authorized contractor), upon the presentation of credentials:
 - a. to enter upon the recipient of the certification's property;
 - b. to have access to and copy at reasonable times any records that must be kept under the conditions of this certification;
 - c. to inspect, at reasonable times, any monitoring or operational equipment or method; collection, treatment, pollution management or discharge facility or device; practices required by this certification; and any mitigation wetland site;
 - d. to sample or monitor any discharge of pollutants or any mitigation wetland site.
5. Complete all approved discharges no later than two (2) years of the date of issuance of this Section 401 Water Quality Certification. The applicant may request a one (1) year extension to the Section 401 Water Quality Certification by submitting a written request ninety (90) days prior to the deadline stated above. The written request shall contain an account of what discharges and mitigation have been completed and reasons for the need of the extension.

PROJECT SPECIFIC CONDITIONS:

The recipient of the certification shall:

1. Remove any temporary causeway or other structures used to facilitate construction or access upon completion of construction activities.

2. Install silt fence or other erosion control measures around the perimeter of any wetlands and/or other waterbodies to remain undisturbed at the project site.
3. Allow no construction equipment, temporary run-arounds, coffer dams, causeways, or other such structures to enter or be constructed within the stream, unless specifically stated, depicted, or detailed in the aforementioned correspondence and project plans. A modification of this Section 401 Water Quality Certification is required from this office if any of the aforementioned items are needed for project construction.

This granting of Section 401 Water Quality Certification does not relieve the recipient of the certification from the responsibility of obtaining any other permits or authorizations that may be required for this project or related activities from IDEM or any other agency or person. You may wish to contact the Indiana Department of Natural Resources at 317-232-4161 concerning the possible requirement of natural freshwater lake or floodway permits, or the IDEM stormwater permits section at 317-233-1864 concerning the possible need for 327 IAC 15-5 (Rule 5) permits if you plan to disturb greater than 5 acres of soil during construction.

This certification does not:

- (1) authorize impacts or activities outside the scope of this certification;
- (2) authorize any injury to persons or private property or invasion of other private rights, or any infringement of federal, state or local laws or regulations;
- (3) convey any property rights of any sort, or any exclusive privileges;
- (4) preempt any duty to obtain federal, state or local permits or authorizations required by law for the execution of the project or related activities; or
- (5) authorize changes in the plan design detailed in the application.

Failure to comply with the terms and conditions of this Section 401 Water Quality Certification may result in enforcement action against the recipient of the certification. If an enforcement action is pursued, the recipient of the certification could be assessed up to \$25,000 per day in civil penalties. The recipient of the certification may also be subject to criminal liability if it is determined that the Section 401 Water Quality Certification was violated willfully or negligently.

This certification is effective 18 days from the mailing of this notice unless a petition for review and a petition for stay of effectiveness are filed within this 18-day period. If a petition for review and a petition for stay of effectiveness are filed within this period, any part of the certification within the scope of the petition for stay is stayed for 15 days, unless or until an Environmental Law Judge further stays the certification in whole or in part.

This decision may be appealed in accordance with IC 4-21.5, the Administrative Orders and Procedures Act. The steps that must be followed to qualify for review are:

1. You must petition for review in a writing that states facts demonstrating that you are either the person to whom this decision is directed, a person who is aggrieved or adversely affected by the decision, or a person entitled to review under any law.

2. You must file the petition for review with the Office of Environmental Adjudication (OEA) at the following address:

Office of Environmental Adjudication
100 North Senate Avenue
IGCN Room N1049
Indianapolis, IN 46204

3. You must file the petition within eighteen (18) days of the mailing date of this decision. If the eighteenth day falls on a Saturday, Sunday, legal holiday, or other day that the OEA offices are closed during regular business hours, you may file the petition the next day that the OEA offices are open during regular business hours. The petition is deemed filed on the earliest of the following dates: the date it is personally delivered to OEA; the date that the envelope containing the petition is postmarked if it is mailed by United States mail; or, the date it is shown to have been deposited with a private carrier on the private carrier's receipt, if sent by private carrier.

Identifying the certification, decision, or other order for which you seek review by number, name of the applicant, location, or date of this notice will expedite review of the petition.

Note that if a petition for review is granted pursuant to IC 4-21.5-3-7, the petitioner will, and any other person may, obtain notice of any prehearing conferences, preliminary hearings, hearings, stays, and any orders disposing of the proceedings by requesting copies of such notices from OEA.

If you have procedural questions regarding filing a petition for review you may contact OEA at 317-232-8591.

If you have any questions about this certification, please contact Mr. Ryan Cassidy, Project Manager, of my staff at 317-234-1221, or you may contact the Office of Water Quality through the IDEM Environmental Helpline (1-800-451-6027).

Sincerely,



Martha Clark Mettler, Chief
Watershed Branch
Office of Water Quality

cc: Tim Smith, USACOE- Indianapolis
Liz McCloskey, USFWS
Keith Poole, IDNR
John Richardson, J.F. New & Associates